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A NEW SPECIES OF *EIMERIA* (APICOMPLEXA: EIMERIIDAE) FROM THE BRUSHTAIL POSSUM, *TRICHOSURUS VULPECULA* (DIPROTODONTIA: PHALANGERIDAE)

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Summary

O'CALLAGHAN, M. G. & O'DONOGHUE, P. J. (2001) A new species of *Eimeria* (Apicomplexa: Eimeriidae) from the brushtail possum, *Trichosurus vulpecula* (Diprotodontia: Phalangeridae). *Trans. R. Soc. S. Aust.* **125** (2), 129-132, 30 November, 2001.

A new species of *Eimeria* is described from the brushtail possum (*Trichosurus vulpecula*). Fifty (24%) of 212 faecal samples were positive for coccidia. Sporulated oocysts of the new species are ellipsoidal to cylindrical, slightly pointed at one end, 41.4 x 22.7 µm, with a double oocyst wall, micropyle, oocyst residuum and refractile polar granule. Each oocyst contains four ellipsoidal to pyriform sporocysts 15.6 x 9.9 µm, with a Stieda body, sub-Stieda body and sporocyst residuum. Each sporocyst contains two sporozoites completely filling the sporocyst and containing a large and small refractile globule.

KEY WORDS: Coccidia, *Eimeria*, *Eimeria trichosuri* sp. nov., brushtail possum, *Trichosurus vulpecula*.

Introduction

The common brushtail possum is one of the most familiar of Australian native animals inhabiting most cities. Three genera belonging to the Family Phalangeridae occur in Australia: *Phalanger*, the cuscuses, of which there are two species inhabiting northern Queensland, *Trichosurus*, the brushtail possums and *Wyulda squamicaudata* Alexander, 1918, the scaley tailed possum (Schink *et al.* 1992). The northern brushtail possum, *T. arnhemensis* Collette, 1897 inhabits north-western tropical Australia, the mountain brushtail, *T. caninus* (Ogilby, 1836), inhabits high country in eastern Australia while the common brushtail, *T. vulpecula* (Kerr, 1792), is the most widely distributed, occupying eastern, central, western and southern Australia including Tasmania and also New Zealand, where it has been introduced (Schink *et al.* 1992). It is arboreal and nocturnal and spends the day in the hollow of a tree.

Although *Eimeria* species have been reported in brushtail possums in Australia (Presidente *et al.* 1982; O'Callaghan & Moore 1986; Viggers & Spratt 1995) and in New Zealand (Stankiewicz *et al.* 1996, 1997a, b, 1998) no *Eimeria* species has been described nor named from brushtails nor any member of the Family Phalangeridae. Here we describe a new species of *Eimeria* found in *Trichosurus vulpecula* from several localities in Australia and New Zealand.

Materials and Methods

Most faecal samples examined were collected from live-trapped possums captured in Queensland, Victoria, Tasmania and South Australia in 1994 and 1995; the remaining samples were collected from dead animals in New Zealand and from the ground in Tasmania in 2001. Faecal samples were transported to the laboratory and examined for the presence of coccidia following a centrifugal flotation in saturated magnesium sulphate solution (SG 1.30). Positive samples were placed into 2% aqueous (w/v) potassium dichromate and stored at room temperature for up to 12 weeks. Sporulated oocysts were recovered in magnesium sulphate solution and examined under an oil immersion 100x objective in an Olympus microscope fitted with a Nomarski differential interference contrast system. Measurements were made with an eyepiece graticule calibrated with an ocular micrometer. All measurements in the text are given in micrometers (µm) as mean ± standard deviation with range in parentheses. A phototype of unsporulated and sporulated oocyst has been deposited in the US National Museum, Beltsville, Maryland, Parasite Collection (USNPC No. 91524).

Results

Oocysts were recovered from faecal samples of 50 (24%) *T. vulpecula* collected at 15 localities in eastern and southern Australia and two in New

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TABLE 1. *Material examined, localities, year of collection and number of samples positive for oocysts of* Eimeria trichosuri.

Locality			Year	No. collected	No. positive
Tasmania, Launceston					
		Suburban	1994 & 2001	11	3
		Rural	1994 & 2001	34	5
	Upper Blessington		2001	6	3
Victoria	Sutton Grange		1994	19	5
	Axe Creek		1994	1	0
	Culgoa Mallee		1994	4	0
	Tang Swamp		1994	12	3
	unidentified		1994	4	1
South Australia					
	Adelaide		1995	10	0
	Kangaroo Island		1995	30	6
Queensland					
	Brisbane		1995	19	0
	Rockhampton		1995	23	6
	Townsville				
		Pallerenda	1995	6	1
		City	1995	16	9
New Zealand					
	Bulls		2001	12	6
	Taniha		2001	5	2
Total				212	50

Zealand (Table 1). Morphological characters conform to those of the genus *Eimeria* in that they contain four sporocysts per oocyst and two sporozoites per sporocyst. The coccidia were identified as a new species of *Eimeria* which is described below.

Eimeria trichosuri sp. nov.
(FIGS 1-4)

Material examined

Oocysts in faeces from four animals, from Sutton Grange, Townsville, Launceston and Bulls.

Phototypes: Holotype from faeces of *T. vulpecula* Townsville, Queensland; paratype from faeces of *T. vulpecula* Launceston, Tasmania (USNPC No. 91524).

Description

Sporulated oocyst (n=120) ellipsoidal to cylindrical; 41.4 ± 3.20 (34.4 - 49.2) x 22.7 ± 2.67 (18.4 - 27.8) with a length:width ratio 1.8 (1.3-2.6); double oocyst wall, outer wall smooth, occasionally stippled at micropylar end, colourless to yellow, 1.6-2.0 in thickness; inner wall clear, colourless, 1.0 thick, oocyst residuum consisting of globules up to 3.0 in diameter, occurring either as a loose aggregate or scattered throughout oocyst; micropyle present, 3.2-4.0 wide, 1-2 refractile bodies present, occasionally disintegrated; 4 ellipsoidal to pyriform sporocysts (n=110) 15.6 ± 1.02 (13.0 -18.0) x 9.9 ±

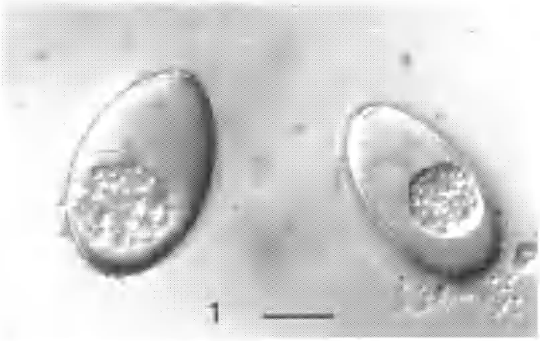
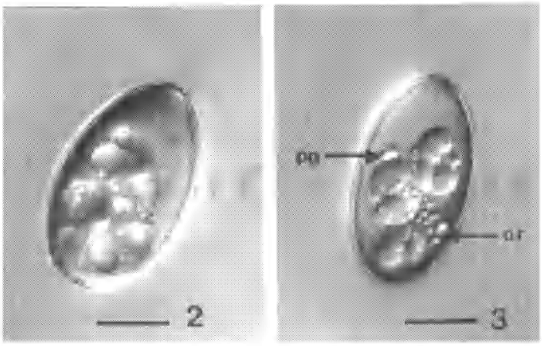


Fig. 1. Unsporulated oocysts of *Eimeria trichosuri* sp. nov. Scale bar = 14 µm.



Figs 2, 3. Sporulated oocysts of *E. trichosuri* sp. nov. Abbreviations: pg, polar granule; or, oocyst residuum. Scale bars = 14 µm.

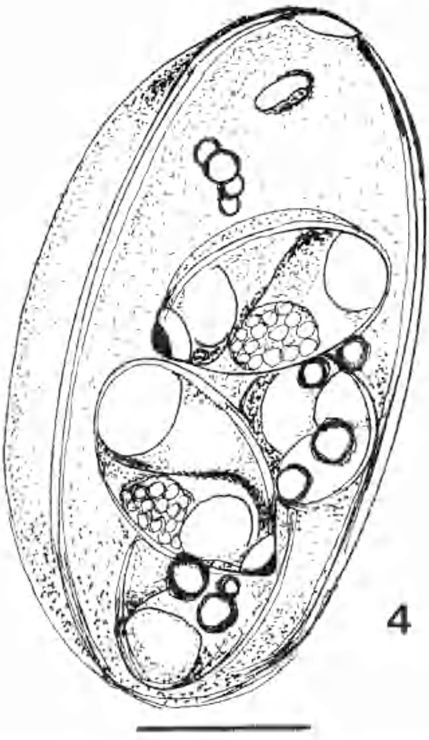


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Fig. 4. Composite line drawing of sporulated oocyst of *E. trichosuri* sp. nov. Scale bar = 10 µm.

0.69 (8.2 - 12.0) with length:width ratio 1.6 (1.1-2.0); slightly pointed at one end with a cap or knob-like Stieda body; sub-Stieda body present; sporocyst residuum an accumulation of small globules 5.0-5.8 in diameter at equator of sporocyst; 2 sporozoites present, lying head to tail each containing a large refractile globule 5.0 in diameter and a smaller refractile globule 2.5 in diameter.

Remarks

No *Eimeria* species have been described from the family Phalangeridae until now. Of the *Eimeria* species described from the order Diprotodontia in Australia, oocysts of the new species most closely resemble *E. gaimardi* Barker, O'Callaghan & Beveridge 1988 from *Bettongia gaimardi* (Desmarest, 1822), the Tasmanian bettong. Oocysts of the proposed species differ, however, by being larger (41.4 x 22.7 v. 34.6 x 24.3) and by possessing a micropyle. In addition, the oocyst wall of *E. gaimardi* is thinner than that of the new species and also mamillate in appearance (Barker *et al.* 1988).

Type host

Trichosurus vulpecula (Kerr, 1792) (Marsupialia: Phalangeridae), common brushtail possum.

Type locality

Townsville, Queensland (19° 16' S, 146° 49' E).

Location in host

Oocysts in faeces, developing stages unknown. However, developing stages of what may be the same species have been found previously within the intestinal tract of the same host (Presidente 1984).

Etymology

Specific name derived from the generic name of the host.

Discussion

Most *Eimeria* species described from mammals are known only from oocysts recovered in faecal samples (Levine 1982). Oocyst morphology is used to identify and distinguish between *Eimeria* species although considerable variation in oocyst and sporocyst size is known to occur (Duszynski 1971). Despite some variation in size, shape and colour, the oocysts of *E. trichosuri* sp. nov. were remarkably uniform in their morphological characteristics irrespective of sampling locality or season. We conclude, therefore, that they represent a single *Eimeria* species. Dimensions of coccidian oocysts reported by Presidente (1982) in *T. vulpecula* trapped in rural and urban areas of Melbourne, correspond with the dimensions of the *Eimeria* species described here. Morphometric observations made on oocysts detected in *T. caninus* by Presidente *et al.* (1982) were also similar to those reported in this investigation, suggesting that they may be conspecific. However, further studies on the identity and distribution of *Eimeria* species infecting closely related host species are required before the biological validity of morphologically similar species can be confirmed.

Presidente (1982) did not consider coccidia infections detected in possums to be pathogenic. Subsequent studies failed to demonstrate lesions in juvenile possums infected with sporulated oocysts of an undescribed *Eimeria* species (Harrigan & Presidente, unpub. cited by Presidente 1984) and histo-pathological changes were mild in nature. Infections by coccidia in *T. vulpecula* in New Zealand were tentatively associated with diarrhoea (Hutton 1979) but in only two animals. There is little evidence to suggest that the species of *Eimeria* infecting *T. vulpecula* described in this study is pathogenic. However, the number of oocysts detected was generally low and no data are available on the effects of heavy infections in susceptible animals. Further studies are required to determine whether infections may be pathogenic under specific conditions.

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